

## NATIONAL NETWORK POLICY

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### Abstract

Networking has become so successful that access to networks is now a national public policy issue. For a national computer network of the scale of telephone or road systems, who should provide it, who should have access to it, and who should pay for it? Who can use it, and for what? What services should it provide, and

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how is information about them and about the network to be disseminated?

### Introduction

National network policy has no consensus yet. Instead, there are many camps: those who want to discuss speed and protocols and those who want to discuss services; those who want to promote research by reaching high end researchers and those who want to use networks to educate everyone; those who are only interested in big science or big business and those who believe they can connect the world with PCs and dialup modems.

This is a brief overview sketch of many of the issues. We focus on the

TCP/IP Internet and the proposed National Research and Education Network (NREN), but we bring in a few completely different networks. We concentrate on the United States, but we mention some relevant examples from other countries.

Our intent is not to answer all questions, rather to note the issues and the public policy forums that have so far been available to address them.

### Network Providers

There are numerous present or planned providers of network infrastructure in the Internet, and elsewhere.

### HPC and NREN

Senator Albert Gore of Tennessee has put a bill before the U.S. Congress for a High Performance Computing (HPC) Act that includes a National Research and Education Network (NREN). NREN has been compared to the interstate highway system and could be equally influential on not only the research and education communities but also on the economy and the general public. The HPC funds would be disbursed through various federal agencies, including NSF. Who should receive these funds and use them to build and run the network?

NSF, Merit, IBM, and MCI

The NREN proposal builds on the

existing Internet, and particularly on the NSFNET backbone. Policy and some funding for NSFNET come from the National Science Foundation (NSF). The network is run by Merit. Other funding comes from the State of Michigan, IBM (who donated the packet switches) and MCI (who donated the long distance leased lines).

### NSFNET Regionals

NSF provided seed funding for most of the NSFNET regionals, which usually cover a metropolitan area, a state, or a set of contiguous states. These regional networks are interconnected by the NSFNET backbone, and themselves connect campus networks at universities and companies. The NSFNET regionals are all self-funding now.

### PSINet and AlterNet

Performance Systems International (PSI) runs a private national backbone IP network for pay; essen-

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tially anybody who pays for access can use the network for whatever they like. PSINet is interconnected with the NSFNET backbone, but traffic that goes over NSFNET must abide by NSFNET access restrictions.

Altnet is a private national backbone IP network run by UUNET Communications Services. Access issues are essentially the same as for PSINet. Altnet and PSINet recently connected directly to each other.

Both UUNET and PSI also provide dialup UUCP and USENET connections for pay.

### ANSNet

Advanced Network and Services, Inc. (ANS) was incorporated in September 1990. Although the founders were IBM, MCI, and Merit, others may join. Merit has subcontracted NSFNET operations to ANS, which in turn has a joint study agreement with Merit to do the technical work. ANS also runs ANSNet, which is a logically (though not necessarily physically) distinct network from NSFNET. ANSNet is accessible for pay, and has looser usage restrictions. Exactly what the rates for access and usage policies are may be unclear.

### RBOCs

The regional Bell operating companies (RBOCs) that were formed in the breakup of AT&T are experimenting with a protocol and service called SMDS for data provision to end users. This could serve as infrastructure for large parts of the Internet.

### Long Distance Carriers

MCI is already heavily involved in the Internet. Will the other long distance carriers get involved?

### BITNET and SPAN

Lest we forget, the Internet is not the only game in town for research

and educational networking. Even though BITNET and SPAN do seem to be being absorbed into the Internet to some extent, they and other networks, based on other protocols than IP, do exist and continue to exert influence.

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**"Why should local school administrations believe that networking is more than an unnecessary frill that will take away resources from real teaching?"**

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### UUCP, USENET, and FidoNet

Finally, remember that there are many networks that do not depend on IP and are not limited to researchers or academics. UUCP and USENET take mail and news to numerous corporations that might not be able to get on the Internet. FidoNet goes to many low-end machines and their users, and to many countries, that the Internet doesn't touch yet.

We will mention a few other examples below.

### Prodigy

Prodigy is a service sponsored by Sears and IBM. Why is it relevant to a discussion of open networking? Because Prodigy claims it is bringing computer communications to the general public. Some people object to the advertisements and pre-reviewing of all general postings (not private mail) on Prodigy, but they, as a private business running a closed private service, have every right to do what they are doing. Nonetheless, if people experienced with open networks that allow unhampered communications on the same and with

other systems do not bring those networks to the public, Prodigy may be all the public gets.

### Access

Who should NREN (or the more general network) connect? Examples include high end researchers, major research institutions, all institutions of higher education, K-12, libraries, physicians, hospitals, corporations, and the general public.

### High End Researchers

From the beginning of packet switched networking, major projects have been justified on the basis of services for researchers. The ARPANET was built to share what passed for supercomputers at the time. NSFNET was originally justified on the basis of supercomputer access. Services for supercomputer users are a major justification for NREN in the HPC bill. Research is good and necessary, but should most federal networking funds be spent on it alone, now that the technology seems to be mature enough and the infrastructure stable enough to reach wider communities? The traditional funding agency for cutting edge research is DARPA (Defense Advanced Research Projects Agency) and the main one for NSFNET is NSF (the National Science Foundation).

### Higher Education

Almost all institutions of higher education are already connected to the Internet. However, this doesn't mean that all or even a large fraction of their faculty, staff, or students have access, or even know they could. There is still work to be done here.

EDUCOM represents this constituency to some extent, but there

are those who say that EDUCOM really represents computation center administrations, not faculty; if this is true, who does represent higher education for networking? Perhaps FARNET, the Federation of American Research Networks? Or SIGUCCS, the ACM Special Interest Group for University and College Computing Services?

### K-12

There are about 17,000 school districts in the United States that provide education from kindergarten

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through the twelfth grade. How should they be connected, for what services, and who will train users? Why should local school administrations believe that networking is more than an unnecessary frill that will take away resources from real teaching? Teachers don't even have telephones on their desks. How are they to be persuaded and trained to use networks? Should we start with students instead?

Is the point teaching (by traditional organizations and methods) or learning (by access to information and knowledgeable people)?

Volunteers put together a widespread elementary school network, FrEdMail (Free Educational Electronic Mail Network), using Apple II computers that had mostly been shelved by schools. Big Sky Telegraph connects isolated schoolhouses around the State of Montana. The

State of Texas is requesting proposals for a statewide K-12 network. The Province of British Columbia is already implementing one. Are these signs that waiting for the federal government is not the best approach? Or are they signs that it is time for the federal government to get involved?

### Economics

#### Charging

How should charging be done? Should the whole network be completely supported by tax money? This isn't even the case today. Should the network be completely privately funded? Japan has no equivalent of NSFNET, and fast network speeds there are 64 kilobits per second, not 45 megabits or gigabits: this is because no Japanese government agency has taken the role of NSF in funding a high speed national backbone network. Perhaps the answer is a mixture of public and private funding.

Should public funds go to the network providers, to the end users, or to their institutions? Should charges be levied on users or organizations, on bandwidth or packets? Maybe voluntary contributions should be used, like for public radio or shareware?

#### Commercialization and Privatization

Since the federal government can't afford to do it all forever, how should commercialization (use and subsidization of the network by private corporations) privatization (administration and ownership of parts of the network by private corporations) and localization of government support (by states and local governments) be accomplished?

### Regulation

If a nationwide general access utility is being constructed, should it fall under the various regulatory bodies, such as the Federal Communications Commission (FCC) and the Public Utility Commissions, that exist for this purpose? If so, should regulation be based on the model of the telephone companies, television, radio, newspapers, railroads, or some other or new model?

### Social Responsibility and the Law

This is a broad and contentious area, which we only sketch in brief here.

#### Acceptable Use

What usage of the network is acceptable, and by whom?

#### Intellectual Property

If a thing can be copied yet remain unchanged, is it property? If it isn't, how can those who create it be compensated? If it is, how should it be protected?

#### Bill of Rights

Is an electronic journal protected by the First Amendment? Does the Fourth Amendment prevent seizure of computers? What if they're being used for publishing? What if the published information never is printed on paper?

Networks don't stop at national boundaries, and the Bill of Rights is a local ordinance.

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## Services

Users want services, and couldn't care less about protocols. How do new services get introduced into the Internet? Key factors may be: ready availability on a primary software platform (once TOPS-20, now UNIX); a clear advantage over a previous service; documentation, preferably in RFCs; support from vendors; coordination by IETF; lack of N.I.H. reaction. Services that originate on another network have an especially hard time, because people who use the Internet are not more immune to N.I.H. (Not Invented Here) than anybody else.

If it's not listed in the Host Requirements RFC, is it a real Internet service, or is it an experiment?

Once new services are widespread, how do implementations get updated? Consider the Internet Worm that exploited known bugs or software that is simply out of date but that runs on machines run by people who have no incentive to update it.

## Twenty Years of TELNET, FTP, and Mail

SUPDUP might have been better than TELNET, but it was only really implemented on a LISP machines, which have never occupied a central place in the Internet.

Initially rlogin provided facilities that TELNET did not (passing terminal type and login without password), but only because those who wrote rlogin couldn't get permission to modify TELNET. The new facility spread because it was easy to use and it came with 4.2BSD, even though it wasn't interoperable with other systems, and its protocols weren't documented. Now that TELNET has ab-

sorbed the distinctive features of rlogin, rlogin is going away.

## New Infrastructure: DNS, NTP

The Domain Name System (DNS) is largely just a newer support system for the old services. But with its feature of MX records and in combination with similar facilities of other networks, it has permitted Internet domain naming to extend beyond the Internet proper. The Network Time Protocol (NTP) isn't visible to the

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average user, but its coordination of the time of day as kept by systems on the Internet affects everything from distributed file system use to security (dates in access logs are coordinated).

## New Services: NFS, NNTP, and the X Window System

A concerted effort by a vendor (Sun Microsystems) to organize other vendors (NFS), a volunteer project that made a popular external service efficient on the Internet (NNTP), and a consortium effort (X). NNTP probably never would have caught on, due to the tendency of old-time Internet users to equate news with mailing lists, if it hadn't been a carrier for USENET news, which was already very widespread in the UNIX community, whose intersection with the Internet community is large.

## Potential Services: IRC, Z39.50, LISTSERV

Internet Relay Chat (IRC) appeared because there was nothing

like it and someone wrote it. It spread for the same reasons, despite early apprehension by some more traditional Internet programmers.

Z39.50 was wanted, specified, and mostly implemented by the library community.

LISTSERV provides services on BITNET related to mailing lists. In addition to simple forwarding of mail to a distribution list, it also allows automatic subscription and unsubscription, automatic archiving and retrieval, automatic retrieval of a list of LISTSERV lists, or of information about specific ones; and distribution of all functions to a set of LISTSERVs around the network. There is nothing quite like it on the Internet, despite attempts by many to equate it with SMTP, NNTP, or even FTP. There are a couple of free partial UNIX LISTSERV implementations, but there has been no serious consideration as yet of how LISTSERV features should be integrated into existing Internet services such as SMTP and NNTP, or whether they should be.

## OSI Services: X.400, X.500

Although X.400 and X.500 provide many capabilities not generally found on the Internet, there are those who say that they are merely fancy versions of RFC822 and WHOIS, rather than truly new services. They do promise to become widespread, nonetheless.

## Possibilities: broadcast, licenses, information services

There are many possibilities for new services, including broadcast, license servers, user services, information services, mobile access, and private communications.

## Commercial Services

We don't see the OAG and stock market services on the Internet because there's no way (politically and to some extent technically) to charge for them. There are known techniques for providing exchanges of funds across open networks, but they can't be used on the Internet. Should this change?

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## Information

If you want your grandmother to learn to drive your new car, you don't tell her to go learn chemistry, physics, and spatial navigation first. You give her a car with relatively straightforward controls, some maps, and then you still have to teach her to drive. If she is to use our new volksnet, she will need the same things.

## Information and Directory Services

How should information and directory services be provided to network users? Current Network Information Centers (NICs) are strongly tied to specific networks. Users want to know about services, resources, and other users, and don't care what network they are on (or much about what country they are in). Non-network-specific information providers are needed in addition to the network-specific ones.

The number and variety of users is increasing exponentially. The old

system of information dissemination already doesn't work well enough, and was never set up to cope with this kind of growth. A new system will cost money, not just for software (such as knowbots and X.500), but especially for labor-intensive value added information (comparisons and evaluations of information from various sources, simplified explanations for new users, focussed reports for experienced users, etc.). Users need to be convinced to pay, and mechanisms need to be set up for charging.

## External Information

How should information about the network be provided to those who do not use it?

## Social Responsibility

How can social responsibility on the part of network users be encouraged?

## International Connections

What policies should be in place for international connections? Academic disciplines do not respect national borders, nor do commercial interests. Computer networks by their nature transcend distance, and that is one of their most useful features in many areas of research.

## Forums and Reports

These national public policy issues are beginning to be examined, but so far mostly in a plethora of small closed workshops.

## Harvard

Harvard University held a small workshop on network policy issues last year.

## OTA

The U.S. Congress Office of Technology Assessment (OTA) is holding a series of workshops in preparation for a report to Congress on national networking policy. The first, attended by network users, was in December 1990. The second, for network service providers, was in January 1991. All are being held in Washington, D.C.

## GAO

The General Accounting Office (GAO) is preparing a report for Congress on high speed networking in Japan and Europe.

## NIH

The National Library of Medicine (NLM) of the National Institutes of Health (NIH) held a workshop in July 1990 on the possibility of a national medical computer network,

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and is holding a conference on the same subject this year.

## EFF

The Electronic Frontier Foundation (EFF) has taken a direct role in paying for defense of certain people who were accused of wrongdoing involving computer networks. EFF's larger mission is to educate the public about computers and networks so that law enforcement agencies will not act improperly because they and

the public do not understand the subject.

#### CPSR

With funding from EFF, Computer Professionals for Social Responsibility (CPSR) is holding four workshops over two years on legal issues affecting computers and networks. The first of these was held in February 1991 in Washington, D.C.

CPSR is also co-sponsoring the first conference on Computers, Freedom, and Privacy, limited to 600 attendees, to be held at the San Francisco Airport Marriott Hotel, 25-28 March 1991.

#### A Public Forum?

All these meetings and reports may make it appear that there is an open policy debate going on. In fact, this is not the case. Every one of the above-mentioned meetings (except CFP) is invitation-only. While it is not practical to try to define public policy in a totally open forum, advertising a forum in advance and inviting applications to attend would seem like a good idea.

There are numerous technical committees (such as IETF) and conferences, both commercial (Interop) and by professional societies (SIGCOMM) related to networking. But their primary focus is on technology, not policy.

There are several online conferences or mailing lists related to these policy issues, but they are either closed or not well known.

If we are committing hundreds of millions of dollars to building a new communications medium, is this not a matter of public policy? Should

there not be open public discussion of it, in a forum open to all current and potential network and service providers and users?

#### Resources

All of these books cover the Internet, but none of them are limited to it.

#### *The Matrix*

A comprehensive survey.

*The Matrix: Computer Networks and Conferencing Systems Worldwide*, by John S. Quarterman, Digital Press, Bedford, MA, 1990. \$49.95

Digital order number:

EY-C176E-DP-SS

Digital Press ISBN 155558-033-5

Prentice-Hall ISBN 0-13-565607-9

#### *UDCN*

A directory.

*Users' Directory of Computer Networks*, Tracy Lynn LaQuey, Digital Press, Bedford, MA, 1990. \$34.95

Digital Part Number EY-C200E-DP

Digital Press ISBN 1-55558-047-5

Prentice-Hall ISBN 0-13-950262-9

#### *!:/@*

A quick desk reference.

*!:/@ A Guide to Electronic Mail Networks and Addressing*, by Donnalyn Frey and Rick Adams, O'Reilly & Associates, Newton, MA, 1990. \$26.95. ISBN 0-937175-39-0

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**CFP**

First Conference on Computers,  
 Freedom, and Privacy  
 25-28 March 1991  
 SFO Airport Marriott Hotel  
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## What is Matrix Information and Directory Services

Matrix Information and Directory Services, Inc. (MIDS) provides technical, administrative, and policy information about computer networks. We concentrate on issues not limited to a single network, network provider, or country.

MIDS is not a network provider or hardware or software vendor, yet the principals have over 30 years of experience in the computer field and over 20 years experience designing, installing, and maintaining networks. MIDS brings context, independence, and experience to the global matrix of computer networks

The MIDS newsletter, Matrix News, provides brief overviews in

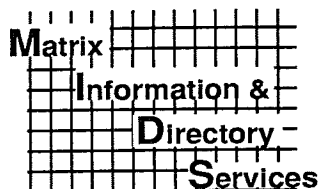
context of facilities, features, or policy issues that affect more than one network. If you would like further information, please feel free to contact us at our office, preferably by electronic mail or subscribe to the newsletter by filling out and returning the subscription form on the back page.

Future topics for this newsletter include an overview of electronic mail across the matrix; the growth and use of the Domain Name System inside and outside the Internet; and the politics of X.400 and the evolution of this complicated messaging system. If there are topics of interest you would like to see covered, please let us know.

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**Which of the following networks or services do you routinely access?**

**TCP/IP Internet** \_\_\_\_\_ **BITNET** \_\_\_\_\_ **UUCP** \_\_\_\_\_ **USENET** \_\_\_\_\_ **MCIMail** \_\_\_\_\_  
**CompuServe** \_\_\_\_\_ **AlterNet** \_\_\_\_\_ **PSINet** \_\_\_\_\_ **ANSNet** \_\_\_\_\_ **Other** \_\_\_\_\_

**Which of the following electronic services do you routinely use on a network?**

**Electronic Mail** \_\_\_\_\_ **Electronic Mailing Lists** \_\_\_\_\_ **Electronic News or Bulletin Board** \_\_\_\_\_  
**Remote File Transfer** \_\_\_\_\_ **Remote Login** \_\_\_\_\_ **Remote Job Entry** \_\_\_\_\_

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